Math 2568, Quiz #7, Summer 2013 Name KEY

Instructions: You may use the calculator to perform row operations, but other work should be shown. Where no work beyond that is required, justify your answer with an explanation. Use exact values.

1. Determine if a vector $H = \left\{\begin{bmatrix} z \\ x \end{bmatrix}, z = a + bi \in C; a, b, x \in R\right\}$ is a vector space. (Use real scalars.) If H is a vector space, give an example of a space on real numbers isomorphic to H.

$\begin{bmatrix} a+bi \\ x \end{bmatrix}$ if $a, b, x = 0$ $\begin{bmatrix} 0+0i \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ ✓ $\vec{0}$ in space

$\begin{bmatrix} a+bi \\ x \end{bmatrix} + \begin{bmatrix} c+di \\ y \end{bmatrix} = \begin{bmatrix} (a+c)+(b+d)i \\ x+y \end{bmatrix}$ $(a+c), (b+d), x+y$ all real, z = correct form

$k\begin{bmatrix} a+bi \\ x \end{bmatrix} = \begin{bmatrix} ka+kbi \\ kx \end{bmatrix}$ ka, kb, kx real if k real

$\boxed{\text{is a vector space}}$

any 3-D space will do $\mathbb{R}^3, P_2$, etc. $\begin{bmatrix} a \\ b \\ x \end{bmatrix}$

2. Find an explicit description of the null space of $A = \begin{bmatrix} 3 & 2 & 1 & 5 & 0 \\ 1 & -1 & 0 & -3 & 1 \\ 4 & 2 & 1 & 0 & 7 \end{bmatrix}$. Give your answer in the form $Span\{\vec{v_1}, \dots\}$.

reduces to $\begin{bmatrix} 1 & 0 & 0 & -5 & 7 \\ 0 & 1 & 0 & -2 & 6 \\ 0 & 0 & 1 & 24 & -33 \end{bmatrix}$

$$Nul\,A = \left\{\begin{bmatrix} 5 \\ 2 \\ -24 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -7 \\ -6 \\ 33 \\ 0 \\ 1 \end{bmatrix}\right\}$$

3. What is the column space of the matrix in #2?

$$Col\,A = \left\{\begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}\right\}$$